

B. Item 5 of the Office Action rejects claims 11, 18 and 22 under 35 U.S.C. §112, second paragraph. Claims 11, 18 and 22 have been amended editorially. Reconsideration of the rejections in view of these amendments is respectfully requested.

II. CLAIMS 3-22 DEFINE PATENTABLE SUBJECT MATTER

A. Item 6 of the Office Action rejects claims 3 and 5 under 35 U.S.C. §102(b) as being unpatentable over European Patent EP 0 783 108 A1 to Werner. This rejection is respectfully traversed.

The Office Action asserts that Werner discloses all of the features of claims 3 and 5. However, it is respectfully submitted that Werner does not disclose a method for producing a thin film-structure comprising the steps of: forming a substrate on a thin film made of an amorphous material having a supercooled liquid phase region, heating the thin film to a temperature within the supercooled phase region and thereby deforming the thin film to a given shape and cooling the thin film to room temperature from the temperature within the supercooled liquid phase region to stop deforming the thin film and thereby forming the thin film-structure, as claimed in claim 3.

Werner discloses that after an assembly is constructed of a semiconductor substrate 1, an auxiliary layer 2 is formed on the substrate 1 and a separating layer 3 and covering layers are formed on the assembly. In this case, the covering layers are made of a (Si or P, etc.) doped glass (SiO_2), and are heated up to about 800°C - 1100°C to be fluidized. That is, the covering layers are heated nearly up to its softening point beyond the supercooled liquid phase region. In fact, if the doped glass is heated up to a temperature within 800°C - 1100°C , it exhibits its viscosity of about 10^3 - 10^5 Pa • s.

On the other hand, as claimed in the claimed invention, an amorphous material having a supercooled liquid phase region is heated up to a temperature within 200°C - 600°C , which is

a typical supercooled liquid phase region, wherein it exhibits its viscosity of about 10^8 - 10^{13} Pa • s, as described on page 3, lines 12-18 of the specification.

Since Werner uses the covering layers in order to fluidize and join them to flatten the surface of the micro-mechanism device, it is natural that the covering layers are heated up to a temperature near its softening point. If the covering layers are heated up to a much lower temperature than the softening point (for example, a temperature within the supercooled liquid phase region), they are not fluidized and thus, the surface of the micro-mechanism device is not flattened through the joint.

In this invention, if the amorphous material having the supercooled liquid phase region is heated up to a temperature near its softening point, it is fluidized and cannot be retained in its configuration and thus, cannot be deformed by a mechanical force in a given shape.

In view of the foregoing discussions, it is respectfully submitted that Werner does not teach or suggest the subject matter of independent claim 3. Thus, Werner cannot teach or suggest the subject matter of claim 5 due to its dependency upon claim 3. Accordingly, withdrawal of the rejections under 35 U.S.C. §102(b) of claims 3 and 5 is respectfully requested.

B. Item 9 of the Office Action rejects claim 4 under 35 U.S.C. §103(a) as being unpatentable over Werner. This rejection is respectfully traversed.

The Office Action admits that Werner fails to disclose the amorphous material having a glass transition temperature within 200°C-600°C and a temperature width of not less than 20°C in the supercooled liquid phase region. However, in view of the discussions above with respect to claim 3, it is respectfully submitted that Werner does not teach or suggest the subject matter of claim 4 due to its dependency upon claim independent claim 3. Thus,

withdrawal of the rejection of claim 4 under 35 U.S.C. §103(a) over Werner is respectfully requested.

C. Item 10 of the Office Action rejects claims 6, 7 and 9-22 under 35 U.S.C. §103(a) as being unpatentable over Werner in view of U.S. Patent 5,994,159 to Aksyuk et al. This rejection is respectfully traversed.

The Office Action asserts that the combination of Werner and Aksyuk discloses the subject matter of claims 6, 7 and 9-22. However, it is respectfully submitted that Aksyuk does not make up for the deficiencies discussed above with respect to Werner.

Werner discloses covering layers in order to fluidize and join the layers to the surface of the micro-mechanism device. It is natural that the covering layers are heated up to a temperature near a softening point. As the covering layers are heated up to a much lower temperature than the softening point, they are not fluidized and thus, the surface of the micro-mechanism device is not flattened through the joint.

As mentioned in the Office Action, Aksyuk teaches a method of fabricating a thin film-structure for a micro-mechanical device in which the thin film beam 8 is deformed by external mechanical force. However, Aksyuk does not teach, suggest or disclose a method for producing a thin film-structure comprising the steps of: forming on a substrate a thin film made of an amorphous material having a supercooled liquid phase region, heating the thin film to a temperature within the supercooled liquid phase region and thereby deforming the thin film to a given shape, as claimed in claim 3.

Accordingly, it is respectfully submitted that, due to their dependency upon claim 3, claims 6, 7 and 9-22 are also allowable. Withdrawal of the rejection of claims 6, 7 and 9-22 under 35 U.S.C. §103(a) as being unpatentable over Werner in view of Aksyuk is respectfully requested.

D. Item 11 of the Office Action rejects claim 8 under 35 U.S.C. §103(a) as being unpatentable over Werner in view of Aksyuk and further in view of European Patent EP 0 762 176 A2 to Tregilgas et al. This rejection is respectfully traversed.

The Office Action asserts that the combination of Werner, Aksyuk and Tregilgas discloses the subject matter of claim 8. However, it is respectfully submitted that Tregilgas does not make up for the deficiencies discussed above with respect to Werner and Aksyuk.

Tregilgas teaches a method of producing a thin film-structure by forming a beam 24 (see Fig. 3F) of an amorphous conductive material. See col. 1, lines 49-53. However, nowhere does Tregilgas discuss an amorphous material having a supercooled liquid phase region that is heated up to a temperature within 200°C-600°C. Additionally, Tregilgas does not discuss heating the thin film to a temperature within the supercooled region to deform the thin film to a given shape, as claimed in independent claim 3.

In view of the foregoing discussion, it is respectfully submitted that the combination of Werner, Aksyuk and Tregilgas does not teach, suggest or disclose the subject matter of independent claim 3. Therefore, due to its indirect dependency upon claim 3, claim 8 is also allowable. Accordingly, withdrawal of the rejection of claim 8 under 35 U.S.C. §103(a) is respectfully requested.

III. CONCLUSION

In view of the foregoing amendments and remarks, it is respectfully submitted that claims 3-22 are in condition for allowance.

Should the Examiner believe that anything further would be desirable in order to place this application in better condition for allowance, the Examiner is invited to contact Applicants' undersigned representative at the telephone number listed below.

Respectfully submitted,



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APPENDIX

Changes to Abstract:

The following is a marked-up version of the amended Abstract.

ABSTRACT OF THE DISCLOSURE

A thin film made of an amorphous material having an supercooled liquid phase region is formed on a substrate. Then, the thin film is heated to a temperature within the supercooled liquid phase region and is deformed by its weight, mechanical external force, electrostatic external force or the like, thereby to form a thin film-structure. Thereafter, the thin film-structure is cooled down to room temperature, which results in the prevention of the thin film's deformation.

Page 3, lines 3-6:

~~To iron out the above problems, this inventors has been intensely studied to develop a new material constituting the thin film structure and a method for producing it. At last, they have found a way to solve the above problems as follows: This invention addresses the above-mentioned problems by developing a new material constituting the thin-film structure and a method for producing them as follows:~~

Page 9, lines 9-12:

In using an appropriate micro pin-driving machine such as a micro manipulator, the thin film may be directly deformed during the heat-holding through the micro pin attached to the machine after it is heated to the temperature of the supercooled liquid phase region.

Page 13, lines 20-21:

Figs. 1-5 are process charts showing a producing process of the thin film-structure of this example.

Page 15, line 20 - page 16, line 2:

Moreover, instead of the paddle 12 as shown in Fig. 1, a solder bump 30 as shown in Fig. 49 or a thick portion 31 as shown in Fig. 10, made of the same material as or the different one from the thin film may be formed on the tip of the thin film. Thereby, the thin film-structure can have a one side-fixed beam-like shape with such a thin film bending downward.

In this example and the examples shown in Figs. 9 and 10, the weight of the tip of the thin film constituting the one side-fixed beam-like thin film-structure was increased to relatively enhance its deflection degree. However, if the deflection degree is not increased such a means is not needed to be done. Moreover, although the thin film 14 was not bent toward the etch pit 16 in this example, it may be bent backward it by turning over the substrate over.

Changes to Claims:

The following is a marked-up version of the amended claims:

3. (Amended) A method for producing a thin film-structure comprising the steps of:

forming on a substrate a thin film made of an amorphous material having an supercooled liquid phase region,

heating the thin film to a temperature within the supercooled liquid phase region and thereby deforming the thin film into a given shape, and

cooling the thin film to room temperature from the temperature within the supercooled liquid phase region to stop deforming the thin film and thereby forming the thin film-structure.

11. (Amended) A method for producing a thin film-structure as defined in claim 10, wherein a magnetic layer made of a magnetic material is formed nearby the thin film, an opposite magnetic electrode being formed opposing to the magnetic layer, and the

thin film is deformed by the magnetic external force generated between the magnetic layer and the opposite electrode.

18. (Amended) A method for producing a thin film-structure as defined in claim 15, wherein the subsidiary layer is a mixed layer made of the material of the substrate and the amorphous material of the thin film-~~which are mixed~~.

22. (Amended) A method for producing a thin film-structure as defined in claim 19, wherein the subsidiary layer is a mixed layer made of the material of the substrate and the amorphous material of the thin film-~~which are mixed~~.